Signposts for Snow Trails

Technology &
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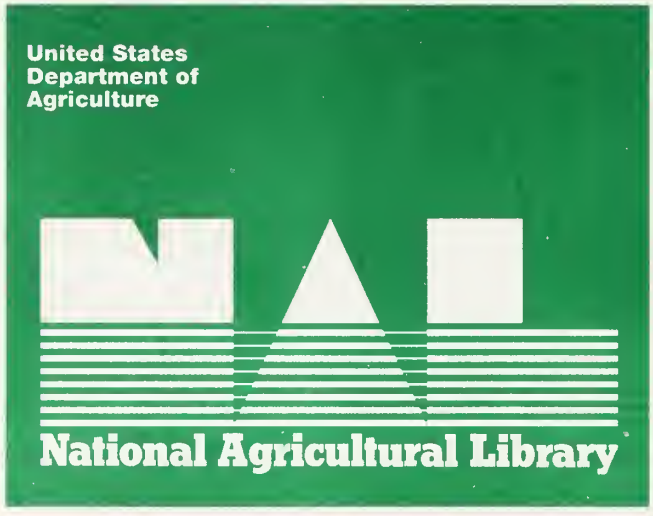
2300 Recreation
March 1998
9823-2806-MTDC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Technology & Development Program
Missoula, Montana

3E32A30–Signposts for Snow Trails

March 1998

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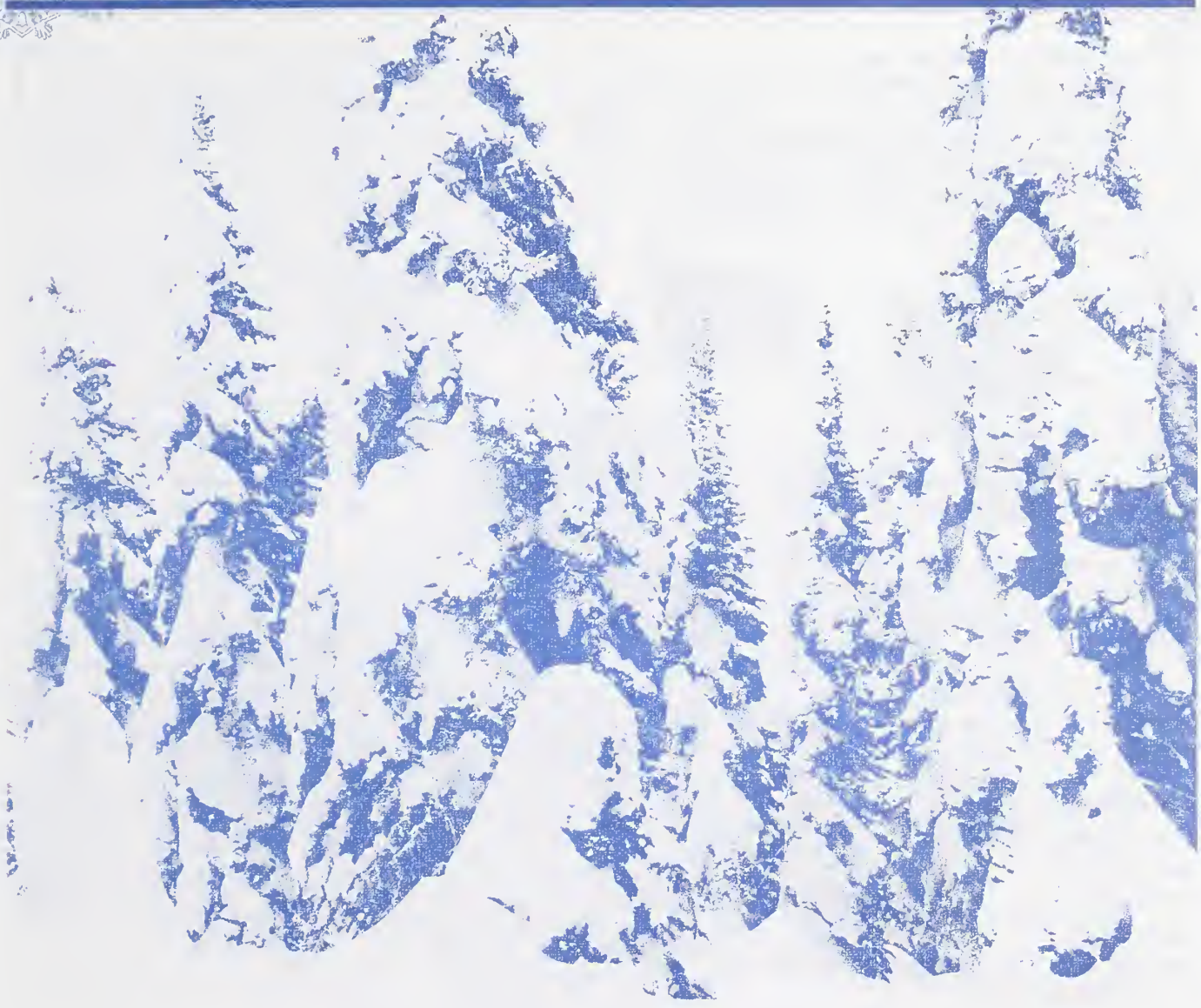


Storm after winter storm, snow piles up deeper and deeper, 20 feet (6m) or more on some snowmobile and cross-country ski trails. Trail signs are normally mounted at a set height on a post planted in the ground. Once the snow has piled up over the sign, the sign is no longer effective.

Ranger Districts with winter trails programs have been dealing with the problems of signing snow trails for as long as they have managed winter trails. The Missoula Technology and Development Center (MTDC) asked snow trail managers to tell us how they keep their winter trail signs visible. We also developed some prototype signposts that we thought might work in all snow depths. The prototypes worked, but were too cumbersome and costly for us to recommend, except in special situations.

This report describes signpost systems that work best in shallow, moderate, and deep snowpacks. Traditional signposts, anchored firmly in the ground, work best for trails with moderate and low amounts of snow. Free-floating signposts, supported only by the snow around them, work best in moderate and deep snowpacks. Telescoping signposts and signposts with temporary bases work for shallow, moderate, and deep snowpacks. However, these signposts are more expensive and take more work to install and maintain than traditional or free-floating signposts. The method of driving a steel fencepost or metal pipe into the ground as a temporary support for a tubular plastic signpost is regarded by the Center as an unacceptable safety hazard.

Acknowledgments

There are many snow trail managers throughout the country that contributed to this report, for which I am grateful. I especially would like to thank the employees of the Deschutes and Gallatin National Forests who invited me on their field reviews and demonstrations.

For their detailed comments and review, I would like to thank:

Dick Dufourd, Deschutes National Forest
Kirk Metzger, Deschutes National Forest
Ron Naber, Gallatin National Forest
Chris Sabo, Deschutes National Forest
Donna Sheehy, Northern Region Engineering
Gary Weigel, Lake Tahoe Basin Management Unit

My thanks to the following MTDC employees who participated in this project:

Bob Beckley
Michelle Beneitone
Gary Hoshide
Mike Huey
Dick Karsky
Bert Lindler
Sara Lustgraaf

Need for Snow Trail Signing

Designated National Forest snowmobile and cross-country ski trails require signing that is consistent with the purpose of the trail, Forest Service policy, the recreation opportunity spectrum, safety, and Forest Plan direction. These should be spelled out in a written sign plan for the trail system. An individual engineering study, called a sign warrant, is required for regulatory and warning signs.

Verify your written sign plan in the field before you implement it. This will ensure that the right signs end up at the right places. Relying solely on an office-generated sign plan will usually result in unnecessary and inappropriate signs.

Standards for Forest Service Signs and Posters (EM-7100-15) covers all types of signage. Before purchasing or installing any cross-country ski or snowmobile trail signs, review this publication, especially Chapter 5, for sound advice and policy requirements. You should be able to borrow a review copy from your Forest Service sign coordinator.

Some states also have guidelines for snowmobile trail signing. Many of these are based on the International Association of Snowmobile Administrators' *Guidelines for Snowmobile Trail Signing.*

Importance of Placement

Placement is often the criteria that determines whether a particular sign will be effective. This is especially critical for winter signing when visibility can be at its worst. Signs should be clearly visible. You may be installing signs on a warm, clear day. But you should position your sign with the unfamiliar user, blowing snow, and fog in mind. Do not rely on travelers following tracks. Assume the tracks have been obliterated.

Mount signs 2 to 6 feet (610 mm to 1.8 m) from the right edge of the trail tread to the nearest edge of the sign to provide adequate clearance (Figure 1).

Signposts cannot raise themselves after getting buried. Every signpost in this report will need periodic inspection and adjustment throughout the winter.

To keep signs free of snow and ice and to increase visibility, place signs where they will be protected from the prevailing wind, if possible. Reassurance blazers (Figure 2) on trees should be mounted with nail heads exposed. The blazer should be placed halfway between the nail head and the face of the tree to allow it to flex in the wind.

When blazers are mounted on trees, prune limbs well above the sign so that snow-covered limbs will not droop and obscure the sign.

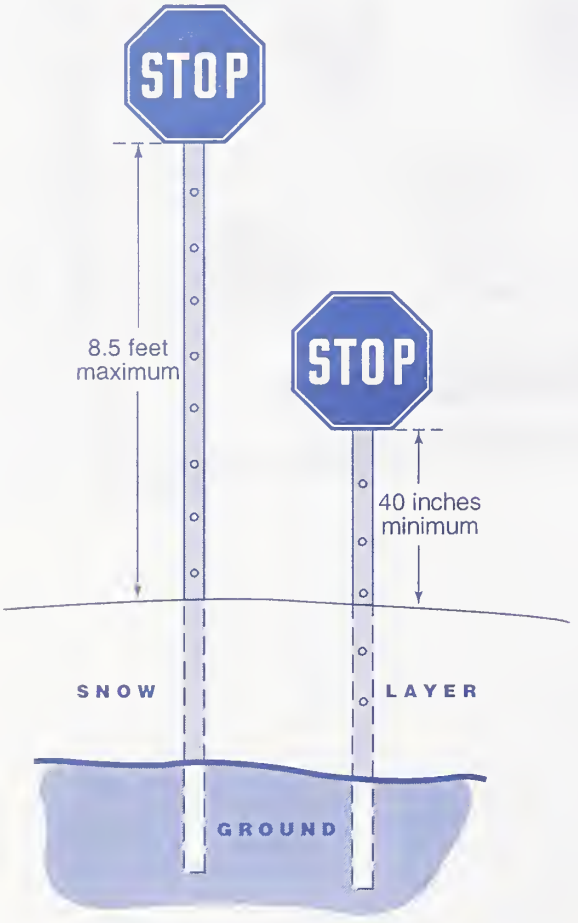


Figure 1—Signs should be mounted at least 40 inches (1 m) above the average maximum snow level at the bottom of the sign. Signs placed more than 8.5 feet (2.6 m) above the snow level may not be visible, especially at night.

Figure 2—The Hebgen Lake Ranger District at West Yellowstone, Montana, uses 2 by 2's with 5-inch by 7-inch (127-mm by 178-mm) blazers as reassurance markers.

Snow Trail Signpost Evaluations

Snow trail managers told MTDC that only a few signposts had passed the test of time. In addition, some nontraditional products, such as telescoping steel signposts and polyvinyl chloride (PVC) plastic pipe, have been effective. All the signpost systems used in the field are simple, inexpensive, and effective (Figure 3).

Choosing the best signpost depends on the expected snow depth. Trail managers commonly use two or three different types of signposts based on the expected snow depths in particular parts of the trail system.

Table 1 (following page) summarizes our findings. Extra-high, fixed-base signposts permanently set in the ground worked best in shallow (0 to 3 feet, 0 to 1 m) and moderate (3 to 12 feet, 1 to 3.7 m) snowpacks. Free-floating signposts of wood or PVC that were supported only by the snow worked best in moderate and deep (more than 12 feet, more than 3.7 m) snowpacks. Temporary bases and telescoping signposts worked for shallow, moderate, and deep snowpacks. They were seldom used because they required more maintenance, were more expensive, or presented unacceptable hazards.

Figure 3—Minus zero: Icy nuts dropping into the snow. Signposts frozen in solid. High winds and poor visibility. Oops! There goes the wrench! Good reasons to keep your signpost system simple.

Table 1—Evaluations of snow trail signposts.

Materials	Works best at (snow level) 0–3 ft	3–12 ft	12 ft+	Description and comments
Fixed Base				
Wooden signposts	✔	✔		Install longer-than-normal posts with holes drilled so the sign can be raised
Tubular steel	✔	✔		Post can be telescoped as depth increases, or better yet, sign can be raised or lowered
Buried steel base	✔	✔		4 by 4 can be fastened to base
Double posts with rungs	✔	✔		An option for bulletin boards or other heavy signs
Free Floating				
PVC pipe		✔	✔	Inexpensive and lightweight—can be painted
Plastic fenceposts		✔	✔	Square for easier sign mounting, more expensive, and shorter than PVC pipe
2 by 2, or 2 by 4 wooden native poles		✔	✔	Simple, inexpensive, and popular for reassurance markers and small signs
Temporary Base and Telescoping				
Wooden base with 2 by 4 signpost	✔	✔	✔	Will need to be able to pull the posts out of the base for deep snow
Portable steel base with PVC signpost	✔	✔	✔	Will need to be able to pull out of base for deep snow
Steel base with steel signpost with telescoping Extren	✔	✔	✔	Worked, but too expensive
Steel fenceposts or conduit pipe base	–	–	–	Created unacceptable hazard—not recommended

Fixed-Base Signposts

Wooden Signposts

Traditional wooden signposts anchored in the ground were the most common signposts. They work fine in areas of low and moderate snowfall, even though the sign may end up less than the recommended 40 inches (1 m) above the snow (Figure 4).

Anticipating the amount of snow accumulation allows trail managers to customize their fixed signposts. For example, in areas with low to moderate snowfall, a standard summer-use sign height may be satisfactory for winter. Or a post two feet (610 mm) taller than normal might be good for year-round use.

For deeper snow, a much taller fixed wooden signpost may be needed. Signposts up to 16 feet (4.9 m) long can have a number of mounting holes that allow workers to move the sign up and down (Figure 5).

Another variation is to bolt post extensions onto existing signposts. The extensions should be bolted on before heavy snowfall to avoid having to dig out the top of the post. Metal braces can be used to help support larger signs (Figure 6).

For holding heavy bulletin boards, the Deschutes National Forest built a ladder-like, double-post frame. The bulletin board hangs from one of the ladder rungs (Figure 7). The 4- by 4-inch posts shown in the photo were not strong enough, so they were replaced with peeled 8-inch (200-mm) logs.

Figure 4—BEFORE: This sign has just about lost its effectiveness.

Figure 5—AFTER: Raising the sign to a higher set of holes makes it effective once again. Some Districts use permanently set signposts up to 16 feet (4.9 m) tall with holes drilled at several levels.

Figure 6—Metal braces can strengthen sign supports on larger signs.

Figure 7—Simplicity itself. Hooks on the back allow the bulletin board to be moved from one rung to the next. Hooks are much easier to work with than nuts and bolts. Two people can easily lift the bulletin board to the next rung. Supplemental security bolts or a lock and chain could be added in areas where users tend to evaluate signage by its warming fire potential.

most areas. The sign could be raised and lowered as needed.

Tubular steel posts can be telescoped with posts of the next larger or smaller size. Because of their relatively tight fit and the tendency of the bolts and steel members to freeze together (and the need to dig out part of the buried post for adjustments), few managers prefer telescoping signposts. It is easier and less expensive to simply move the sign to another set of holes on a fixed signpost.

The steel posts are heavy, so freight costs and the logistics of getting them to the site are important considerations. The underground bases need to be installed before the ground is frozen. The steel signposts are more expensive than most wooden ones. Costs vary too much nationwide to provide a good comparison here.

Steel Signposts

Steel signposts (Figure 8) are popular in areas where a sturdy post is required. They work best for low to moderate snow depths. These signposts, designed for highway signing, are made by several manufacturers. They offer the convenience of a permanent base embedded in the ground, and they have adjustable, removable steel posts for mounting the sign.

The steel posts come in a variety of lengths and dimensions. A 15-foot (4.6-m), 2- by 2-inch (50- by 50-mm) steel post would be long enough for

Figure 8—Steel signposts are quite popular at plowed snowparks where signposts need to withstand the force of plowed or blown snow.

Free-Floating Signposts

In deep snow, signposts supported only by snow work best. In every deep-snow situation, this was the technique crews used, and it is the technique we recommend. Signposts supported only by snow also work well for moderate snow levels.

Figure 9—Standard 2 by 2's or native poles are inexpensive and effective ways to place reassurance markers. They freeze in pretty solidly, however, and are difficult to raise without breaking.

Wooden Signposts

The Payette National Forest mounts signs on 2 by 4's (50 by 100 mm) tamped into the snow. Other Forests and Districts use 2 by 2's (50 by 50 mm) for the same purpose, placing them next to nearly buried signposts in some instances (Figure 9). The 2 by 2's have a tendency to freeze in place in wet snow and are difficult to raise without breaking. Another option for reassurance markers is native 12-foot (3.7-m) poles. During periods of unexpected heavy snowpacks, Districts may stick temporary wooden signposts in the snow on top of buried fixed signposts. All of these signposts are relatively inexpensive.

Ron Naber speaking about Two Top Mountain in Montana:

"The visibility is so poor up here, often the markers are the only way a rider can tell he's on the trail. It's important to keep them visible."

PVC Pipe Signposts

The Deschutes National Forest signs many miles of winter trails and posts wilderness boundaries to prohibit motorized entry. The signposts that work best are 10-foot (3-m) sections of 2-inch (51-mm) and 2½-inch (63.5-mm) Schedule 40 PVC pipe (Figures 10 and 11). On the boundary of the Three Sisters Wilderness, these signposts are exposed to rime, ice, heavy snow, winds of up to 80 miles per hour (128 kilometers per hour), and temperatures as low as -20 °F (-29 °C).

Signs are placed early in the season in at least 3 feet (1 m) of snow, then raised four to six times during the course of the winter as snow piles up.

Figure 10—PVC pipe has worked best to post the Three Sisters Wilderness boundary. The upper two-thirds of the pipe is painted orange to improve visibility.

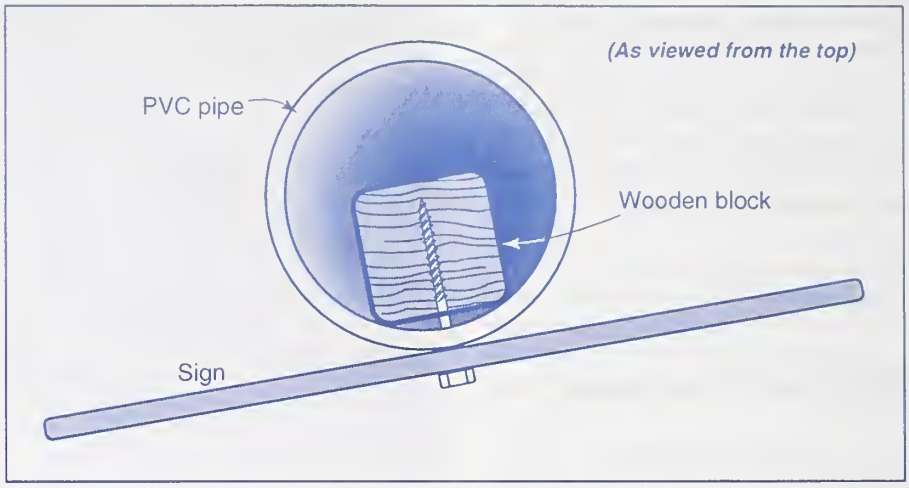
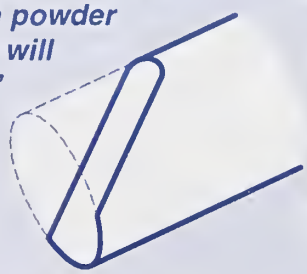


Figure 11—A wooden block inside the round PVC pipe allows signs to be mounted securely. Drill holes perpendicular to the grain to prevent the wood from splitting. Then screw the lag bolts into the wood.

• In the heavy, wet snow of the Cascades, PVC pipe has a tendency to freeze to the snow. A couple of sharp whacks on the top of the pipe with a short piece of 2 by 4 usually breaks it free.

• "There is a knack to setting PVC signposts so they don't weathervane. I cut about 75% of the bottom end of the post at about a 45° angle. This helps to keep it from spinning. I set the post by pushing it into the snow until it hits a dense layer, then I give it a little twist to set it. If you set it just in powder snow, it most likely will turn with the wind."

—Chris Sabo



Two inexpensive products to consider for snow trail signposts are white PVC Schedule 40 water line and gray PVC Schedule 40 electrical conduit. We saw the white pipe being used for signposts in the field. The gray pipe has ultraviolet (UV) inhibitors that provide some degree of resistance to degradation by sunlight and might work better. It costs about the same as the white pipe.

To improve visibility, you will probably want to paint the part of the PVC pipe that extends above the snow. Do not paint the whole pipe, because you want the part buried in the snow to be as slippery as possible. Paint doesn't stick to untreated PVC, so our local paint store suggested scuff sanding to prepare the surface, then painting with polyurethane enamel. We did not have time to verify how well this works (Figures 12 and 13).

PVC pipe becomes brittle at very cold temperatures and after long exposure to sunlight. Painting may help protect it from sunlight. How long will the pipe last in the field? The Bend/Fort Rock Ranger District on the Deschutes National Forest reported increased ice and snow buildup during the third season of use, making the PVC posts more difficult to lift. This could be due to the degradation of the PVC. Perhaps it could be temporarily fixed by waxing the lower part of the post. In this instance, the white pipe was used instead of the gray, UV-resistant pipe.

Figure 12—Two PVC pipes hold this large sign in place. Because the posts are not anchored to the ground, they can be raised as the snow becomes deeper.

Figure 13—Reflectorized tape greatly improves the sign's visibility at night.

Schedule 40 PVC pipe costs about $4.25 for a 10-foot (3-m) length of 2-inch (51-mm). This is cheaper than any other satisfactory plastic product that we looked at. PVC is also lightweight and is available everywhere. For larger signs, 3-inch (76-mm)-diameter Schedule 40 PVC costs about $8.50 for 10 feet (3 m).

PVC Fenceposts

The Bend/Fort Rock Ranger District also tried 5- by 5-inch (125- by 125-mm) polyvinyl fenceposts placed in the snow. The square fencepost provides a flat surface for attaching the sign. The posts are available from several manufacturers. Even though the posts (Figure 14) are much more expensive than PVC pipe ($13.25 for a 6.5-foot (2-m) post), they are not long enough for many snow installations.

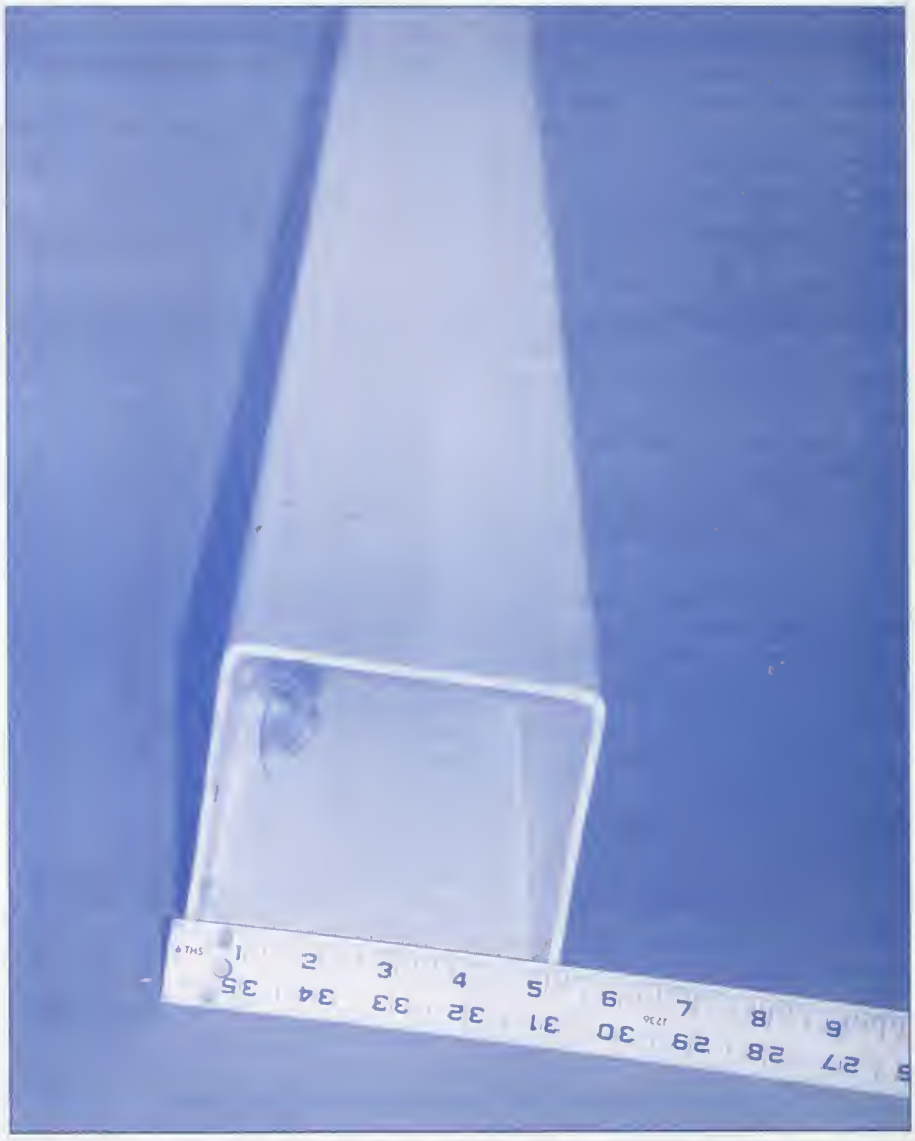


Figure 14—Plastic fenceposts make effective signposts, but are much more expensive than round PVC pipe.

Temporary Bases

What should you do in situations where there isn't enough snow to support a freestanding sign, but you don't really want a permanent signpost?

One option is to use a permanent signpost anyway. You can always remove or cover the sign during the off season, or install a hinged sign that can be folded over when it is not being used.

Another option is to remove the signposts seasonally. MTDC looked at several techniques for temporarily mounting a signpost.

Square Plastic Signposts Supported by Steel Rods

Kirk Metzger on the Sisters Ranger District, Deschutes National Forest, experimented with 10-foot (3-m) long, 3-inch (76-mm) square plastic downspouts placed over steel index rods.

He drove a 6-foot (1.8-m) fence post, scrap pipe, or 2-inch (51-mm) diameter electrical metal conduit into the ground with a post driver. The metal pipe supported the sign post when the snowpack was shallow.

He attached a sign to a 10-foot (3-m) long, 3-inch (76-mm)-square section of plastic downspout and slid the downspout over the index rod. The plastic downspout could be raised as the snow got deeper.

Kirk found that the plastic gutters are not very strong and they shatter in high wind and extreme cold. Stronger square tubular materials, like 4- by 4-inch (100- by 100-mm) PVC fence posts or round PVC pipe would work better.

We find this design unacceptable because the steel index rods present an unacceptable hazard to snowmobilers or skiers who may run into them. What seems like a safe, out-of-the-way signpost location may look like the middle of the trail after several feet of snow have fallen. And, when it is time to remove the seasonal snow trail signs, the index rods are probably still frozen in the ground and cannot be removed, leaving these hazards for the summer season.

Because of the safety hazard, we do not recommend using short, narrow support rods like steel fence posts or conduit that are driven into the ground to support signs or signposts.

Buried Steel Brackets

Square tubular steel signposts can be mounted on a bracket driven into the ground. When the steel signpost is removed, the mounting frame is only a few inches off the ground. The signpost can be removed in the spring and reinstalled in the fall. This assumes that you can find the mounting bracket in the spring, and that you install the signpost before it is covered with snow and ice each fall. Such a signpost is best suited for plowed parking lots and junctions where it will be easy to find.

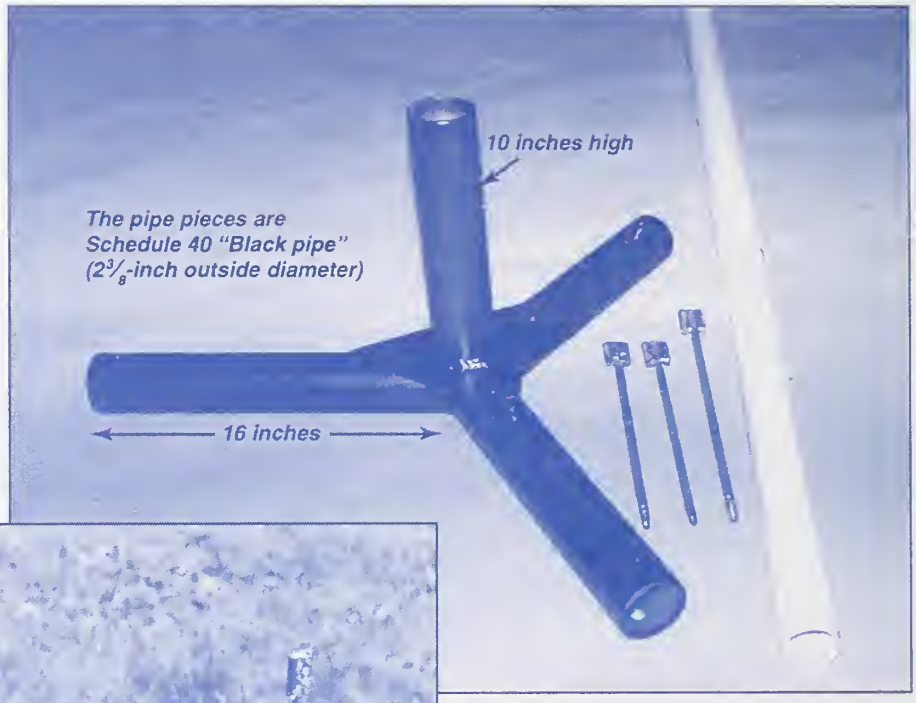
The Crescent Ranger District on the Deschutes National Forest drives 4-foot-(1.2-m)-long pieces of 4- by 4-inch (100- by 100-mm) steel tubing into the ground, leaving 6 to 8 inches (150 to 200 mm) exposed. All but 18 inches (450 mm) of the tube is filled with gravel for drainage. Wooden signposts (4 inches by 4 inches) are placed in the buried tubing during the winter and removed in summer. The tubing needs to be covered with a metal cap or duct tape during the off season to keep it from filling with dirt.

Portable Mounts

One District mounts its signs on 10-foot (3-m), 4- by 4-inch (100- by 100-mm) posts with cross braces at the bottom, and sometimes uses sandbags for extra support in windy areas.

They are set in 2 feet (610 mm) of snow initially. When they need to be raised, volunteers dig them out, presumably bases and all, and reset them.

Another portable sign mounting base was developed by Gary Weigel when he worked on the Shoshone National Forest. These steel bases (Figure 15) are relatively easy to fabricate and can be customized to fit the type and size of signpost you are using. They can be pinned to the ground for better support.



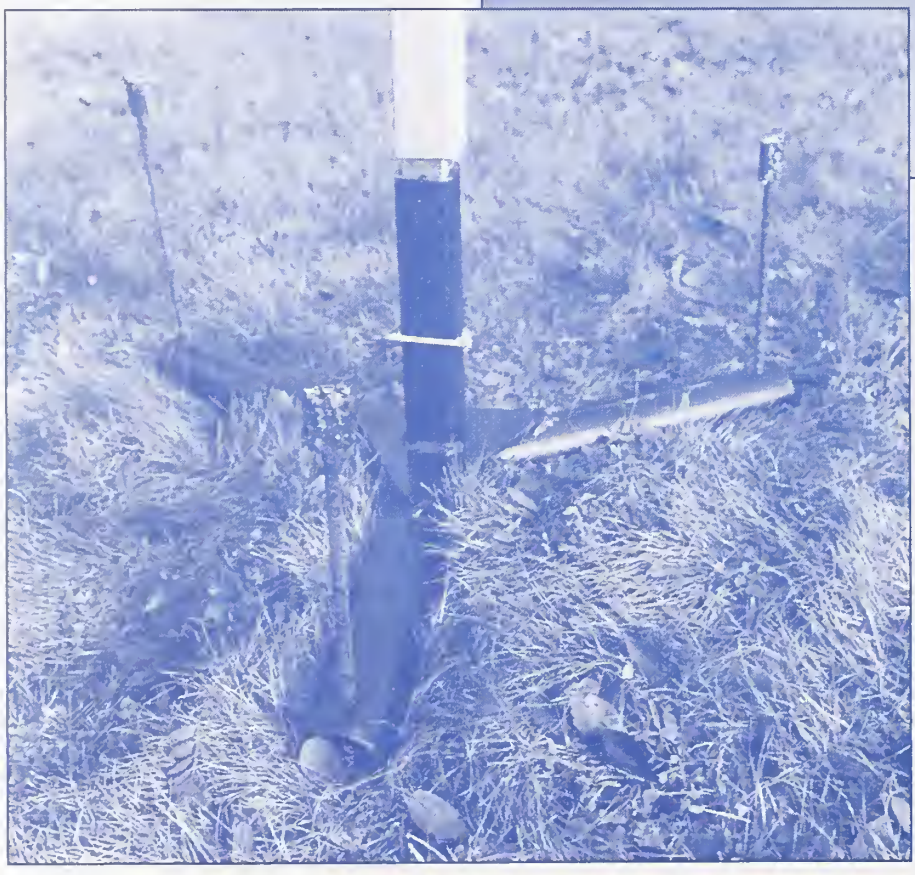


Figure 15—Gary Weigel designed this portable base. It is easily fabricated and can be customized to fit round or square posts. This base was used for MTDC's telescoping PVC signpost system (above), and also for the square tubular steel and Extren signpost (at left).

The signposts can be permanently attached to the base or left unbolted so that the posts can be pulled out to raise the sign. The signpost may freeze to the base, making it immovable.

The bases need to be removed in the spring after the ground has thawed. Locating and transporting the heavy bases after all the snow had melted created enough extra work that one District discontinued using them.

Telescoping Signposts

Why not develop a telescoping signpost that could be raised as snow depths increase? This would allow a single signpost to serve for shallow, moderate, and deep snowpacks.

MTDC looked at three such systems. One is commercially available and the other two were prototypes constructed in our shop.

Telescoping square tubular steel signposts are commercially available. They can be detached from bases driven nearly flush with the ground. They work quite well for many situations.

To reduce weight and reduce the likelihood that close-fitting steel posts may freeze together, MTDC telescoped a 2-inch (51-mm)-square plastic tube onto a square tubular steel post. It was mounted with quick-release fasteners rather than nuts and bolts (Figure 16). In limited field testing, the unit held up well and did not freeze. Extren, the industrial-strength plastic we used, costs nearly $5.00 per foot. It is far too expensive for us to recommend as an alternative to less expensive signposts that are easier to install.

MTDC also telescoped two lengths of $1\frac{1}{2}$-inch (38-mm) and 2-inch (51-mm) Schedule 40 PVC pipe (Figure 17). This also worked, although we do not know how sturdy this would be on sideslope installations, where snow continually migrates downhill and would bend the signpost.

If you really need a system that is anchored to the ground, the telescoping PVC signposts might work. We did not see our field testers clamoring to use them instead of permanent signposts or free-floating signposts—methods they recognized as simpler, easier to maintain, and cheaper.

Figure 16—MTDC's steel and Extren plastic telescoping signpost system. The Extren plastic cost too much for us to recommend this system even though it is satisfactory otherwise. Telescoping two pieces of steel tubing is less costly.

Figure 17—The top of MTDC's telescoping PVC signpost. It was difficult to line up the holes drilled through the PVC, and who wants to dig down this far to reach the buried fastener, anyway?

About the Author...

Brian Vachowski has been a Project Leader specializing in recreation, trails, and wilderness projects at MTDC since 1993. He received a bachelor of science degree in forestry from the University of Massachusetts in 1974, and a master of science degree in outdoor recreation from Utah State University in 1976. Brian has worked for the Nez Perce, Bighorn, Winema, and Routt National Forests in recreation, wilderness, lands, planning, rural community assistance, special uses, fire, and timber positions. Before coming to MTDC he was an assistant staff officer for wilderness and recreation on the Nez Perce National Forest.

Notes

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Vachowski, Brian. 1998. Signposts for snow trails. Tech. Rep. 9823-2806-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 18 p.

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Keywords: signboards and signposts, signs, snow trails, trails.

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